

REVISION AND TYPIFICATION OF SOME SPECIES OF *IXORA* (RUBIACEAE) FROM CENTRAL AND SOUTHERN BRAZIL

Piero G. Delprete¹

*Institute of Systematic Botany
The New York Botanical Garden
Bronx, NY 10458-5126, U.S.A.
pdelprete@nybg.org*

ABSTRACT

In connection with the treatment of *Ixora* for the *Flora Fanerogâmica do Estado de São Paulo*, *Flora Ilustrada Catarinense* and *Flora de Goiás e Tocantins*, it was necessary to undertake a taxonomic study of the taxa occurring in Central and Southern Brazil. Five native species occur in the state of São Paulo, and 12 taxa originally described by Müller Argoviensis are here treated as synonymous with the recognized species. Only one native species occurs in the state of Santa Catarina. Full typification, synonymies, brief descriptions, specimens cited, and a key to the *Ixora* of São Paulo are here presented.

KEY WORDS: *Ixora*, Ixoroideae, Rubiaceae, typification, Brazil.

RESUMEN

En conexión con el tratado de *Ixora* por la *Flora Fanerogâmica do Estado de São Paulo*, la *Flora Ilustrada Catarinense* y la *Flora de Goiás e Tocantins* fue necesario realizar un estudio taxonómico de los taxa presentes en Brasil central y meridional. Cinco especies nativas ocurren en el estado de São Paulo y doce taxa originariamente descritos por Müller Argoviensis son tratados aquí como sinónimos de especies reconocidas. Solamente una especie nativa ocurre en el estado de Santa Catarina. Se presentan aquí tipificaciones y sinonimias completas, descripciones, especímenes citados y una clave para las especies de *Ixora* de São Paulo.

Ixora is a pantropical genus of about 350 species, with most of them present in tropical Asia and the islands of the South Pacific, about 37 species in continental Africa, about 35 species in Madagascar, and about 45 species in the Neotropics. Although the African species have been recently studied by De Block (1998), revisions for the Neotropical or the Asiatic species have never been attempted.

During the preparation of the treatment of *Ixora* for the *Flora Fanerogâmica do Estado de São Paulo* (Delprete, in press) and *Flora Ilustrada Catarinense* (Delprete et al., submitted), and *Flora de Goiás e Tocantins*, it was necessary to examine material from many Brazilian and international herbaria, and to study the type specimens of the species described by Bentham (1850) and Müller Argoviensis (1875, 1881).

Johannes Müller (1828–1896) was renamed by C.F.P. von Martius (coordi-

¹Current address: National Herbarium of the Netherlands, Utrecht University branch, Plant Systematics, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands, E-Mail: pdelprete@hotmail.com

nator of *Flora Brasiliensis*) as Müller Argoviensis (because he was native of a small town in the canton of Aargau, Switzerland), to distinguish him from other contemporary botanists with the same last name. The personal herbarium of Müller Argoviensis was subsequently included in the Candolle Herbarium (G-DC). Because of their historical value, the specimens of this herbarium are not sent out on loan. In order to examine the type specimens of the *Ixora* species described by Müller Argoviensis, a set of about 80 black and white negatives were made by the staff of the G-DC Herbarium and sent to NY. The negatives were used to make large photographs, which were mounted on NY herbarium sheets. The present work would have not been possible without the close examinations of these photographs.

The most complete treatment of Brazilian species of *Ixora* still remains that of Müller Argoviensis (1881), where he expanded the original descriptions of his new species published a few years before (Müller Argoviensis 1875), and cited additional specimens of contemporary collectors. In his treatments, he distinguished the species of *Ixora* based on leaf shape, presence of colleters inside the calyx, and presence and shape of leaf-like bracts subtending the secondary branches of the inflorescences. All these characters are here considered of little taxonomic significance, and most of Müller Argoviensis' new taxa here studied are reduced to synonymy. In addition, the fruits of the species examined are quite uniform, in being spherical to subspherical and 5–7 mm in diameter, usually reddish to deep red, and consequently without any useful taxonomic characters. Most of the characters considered of taxonomic significance in the definition of the species presented below were found in the stipule shape, length of the stipular arista, leaf venation, inflorescence size and architecture, number of inflorescence secondary branches, flower bud shape (ovoid or oblong-ellipsoid at apex), corolla tube length, corolla lobes length and shape, and corolla tube/lobe ratio. A key to the species of the State of São Paulo is presented below.

Full typification and citation of specimens examined is here presented because this information can not be included in the concise format of the *Flora Fanerogâmica do Estado de São Paulo*. It is my hope that this work will provide an initial contribution towards the clarification of *Ixora* from central and southern Brazil; however, considerable work remains to be done before a revision of the Brazilian species of this difficult genus can be completed.

Ixora brevifolia Benth., *Linnaea* 23:448. 1850. TYPE: BRAZIL. MINAS GERAIS: without locality, 1845–1846 (fl), *Widgren III*9 (LECTOTYPE: UPS! V-134607, here selected; ISOLECTOTYPE: UPS n.v. V-102640; not at GOET, K, S).

Ixora thyrsoides Muell. Arg., **syn. nov.**, *Flora* 58:455, 459. 1875. TYPE: BRAZIL. BAHIA: without locality, 1857, *Blanchet s.n.* (HOLOTYPE: G-DC n.v., photos at NY!).

Ixora warmingii Muell. Arg., **syn. nov.**, *Flora* 58:455, 459. 1875. TYPE: BRAZIL. MINAS GERAIS: Lagoa Santa, s.d. [1863–1865], *Warming s.n.* (LECTOTYPE: G-DC n.v., here selected, photos at C!, NY!).

Ixora glaziovii Muell. Arg., **syn. nov.**, in Mart., Fl. Bras. 6(5):460. 1881. TYPE: BRAZIL. RIO DE JANEIRO: Without locality, s.d. [1861–1895], *Glaziou 10932* (HOLOTYPE: G-DC n.v., photos at NY!; ISOTYPE: B†, photo at NY!).

Ixora membranacea Muell. Arg., **syn. nov.**, in Mart., Fl. Bras. 6(5):458. 1881. TYPE: BRAZIL. RIO DE JANEIRO: without locality, s.d. [1861–1895], *Glaziou 10947* (HOLOTYPE: G-DC n.v., photos at NY!; ISOTYPE: B†, photo at NY!).

Tree up to 20 m tall, to 35 cm at dbh; bark smooth; branchlets glabrous. **Stipules** 4–8 × 3–4 mm, base deltoid, arista 4–6 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaf** blades narrowly elliptic, oblong elliptic to obovate, (4–)8–20 × 1.5–6(–8) cm, apex acute or acuminate, base acute to round, subcoriaceous to coriaceous, glabrous; secondary veins 15–40 each side, tertiary venation subparallel-reticulate; petioles 4–10 mm long, glabrous. **Inflorescences** sessile or pedunculate, paniculate, multiflorous, 5–12 × 3–8 cm, with 2 or 3 lateral branches, these sparsely branches or corymbose; peduncles 2.5–4 cm long, or absent; **bracts** subtending the secondary branches narrowly triangular, 1–4 mm long; **bracteoles** triangular, 0.4–0.7 mm long. **Flower buds** oblong-ellipsoid at apex. **Pedicels** absent or to 2 mm long. **Flowers** sessile or short-pedicellate, fragrant. **Calyx** 0.7–1 mm long; lobes triangular or ovate, glabrous. **Corolla** 6–9 mm long, cream-white; tube 2.6–3.7 × 1–1.5 mm, glabrous outside, pubescent inside; lobes oblong, 3–5 × 0.8–2 mm, apex round, glabrous. **Stamens** 3.5–4.5 mm long; anthers narrowly oblong, ca. 2.5 mm long, apex acute. **Style** ca. 4–6 mm long; style branches narrowly oblong, ca. 2 mm long. **Fruit** globose, 5–6.5 mm diam., glabrous, red.

Selected specimens examined. **BRAZIL. Bahia:** Rd to Abaira, ca. 8 km N of town of Rio da Contas, ca. 13°33', 41°47'W, 1000 m, 18 Jan 1972 (fl), *Harley et al. 15251* (NY); Serra da Água de Rega, ca. 24 km N of Seabra, rd to Água de Rega, 1000 m, 25 Feb 1971 (fr), *Irwin et al. 31058* (NY); Serra da Água de Rega, ca. 28 km N of Seabra, rd to Água de Rega, 1000 m, 27 Feb 1971 (fr), *Irwin et al. 31184* (NY); rd. BA, 12 km from Mucugê, L entrance of Fda. Paraguaçu, 16 Dec 1984 (fl), *Lewis et al. s.n. (SPF 36789)* (NY). **Distrito Federal:** Bacia do Rio São Bartolomeu, 18 Dec 1979 (fl), *Heringer et al. 2950* (NY), 14 Jan 1981 (fr), 5985 (NY); Córrego da Papuda, near barra of Rio São Bartolomeu, 22 Jan 1981 (fr), *Heringer et al. 6026* (NY); Granja do Tamanduá, 6 Oct 1965 (fl), *Heringer et al. 10613* (NY); Rio Corumbá, 120 km from Brasília, 18 Jan 1968 (fl), *Heringer 11618* (NY). **Minas Gerais:** Serra do Cantagalo, São Tomé das Letras, 3 Nov 1984 (fr), *Mello Silva et al. s.n. (SPF 35862)* (NY). **Goiás:** Formosa, 20 Oct 1961 (fl), *Heringer 10740* (NY); Serra dos Pireneus, ca. 9 km S of Corumbá de Goiás, 1000 m, 1 Dec 1965 (fl), *Irwin et al. 10889* (NY); Serra do Caiapó, ca. 50 km S of Caiapônia, rd to Jataí, 900 m, 27 Jun 1966 (fr), *Irwin et al. 17885* (NY); Serra do Caiapó, 66 km of Jataí, 22 Oct 1964 (fl), *Prance & Silva 59565* (NY); Mun. Goiânia, rd. GOM-9, 2 km from Escola de Agron. e Veterinária, 23 May 1968 (fr), *Rizzo & Barbosa 1050* (UFG); Mun. Goiânia, rd. Goiânia-Leopoldo de Bulhões, 18 km from Goiânia, 2 Jul 1968 (fl), *Rizzo & Barbosa 1570* (UFG); Mun. Goiânia, rd GOM-6, 16 km from Goiânia, 2 Nov 1968 (fl), *Rizzo & Barbosa 2622* (UFG[2]); Mun. Goiânia, Morro dos Lobos, 3 Dec 1968 (fl), *Rizzo & Barbosa 2911* (UFG); Mun. Goiânia, rd Goiânia-Senador Canêdo (GOM-7), km 12, 5 Dec 1968 (fl), *Rizzo & Barbosa 2989* (UFG[2]), 27 Dec 1968 (fl), 3159 (UFG); Mun. Goiânia, rd. Goiânia-Senador Canêdo (GOM-7), km 12, 4 Mar 1969 (fl), *Rizzo & Barbosa 3905* (UFG); Mun. Jataí, towards Perolândia, 20 km from Rio Claro, 9 Nov 1972 (fl), *Rizzo 8607* (UFG); Rio Paranaíba, 20 km from Itumbiara, 23 Nov 1972 (fl), *Rizzo & Barbosa 8611* (UFG), 21 Dec 1972 (fl), 8697 (UFG); Mun. Goiânia, Universidade Federal de Goiás, Campus II, Bosque Auguste de Saint-Hilaire, 17 Nov 1978 (fl), *Rizzo et al. 10045* (UFG), 18 Nov 1997 (fl), 12258 (UFG). **São Paulo:**

Mun. Tatuí, rd Sorocabana, 1 Feb 1946 (fl), *Amaral* 36 (SPSF); Mun. Moji Mirim, 27 Oct 1993 (fl), *Árbocz* 14 (IAC), 14 Nov 1993 (fl), 61 (IAC); Mun. Santo Antonio de Posse, Fda. Palmital, 3 Dec 1993 (fl), *Árbocz* 88 (IAC); Mun. Anhembi, Fda. Barreiro Rico, 15 Dec 1981 (fl), *César s.n.* (HRCB 3048), 30 Sep 1982 (fr), *s.n.* (HRCB 3333) (HRCB); Mun. Agudos, Fda. Cia. Cervejaria Brahma, 23 Oct 1997 (fl), *Cristianini & Assis Camargo* 651 (SP), 20 Nov 1997 (fl), 718 (SP); Mun. São Paulo, Parque Estadual da Serra do Mar, Núcleo Curucutu, 23°59'S, 46°44'W, 19 Dec 1996 (fl), *Garcia et al.* 967 (NY); Mun. Moji Guaçu, Fda. Campininha, 17 Jan 1977 (fl), *Gibbs & Leitão Filho* 4275 (NY, UEC); Mun. Itararé, Ibiti, Estação Experimental Monte Alegre, 1 Aug 1946 (st), *Kuhlmann s.n.* (IAC 28616) (IAC, SP); Mun. Ilha do Cardoso, 11–14 Dec 1979 (fr), *Leitão Filho et al. s.n.* (UEC 10823) (UEC); Mun. Pereira Barreto, Fda. Lagoinha II, 7 Nov 1985 (fl), *Martins et al.* 95 (HRCB, SP, UEC); Mun. Campinas, Bosque dos Jequitibás, s.d. (fl), *Matthes* 7757 (UEC), 7758 (UEC); Mun. Cajuru, Fda. Sta. Carlota, 15 Dec 1999 (fl), *Nicolau et al.* 2091 (NY), 2092 (SP); Mun. Américo Brasiliense, 23 Sep 1992 (st), *Rocha* 17 (ESA); Mun. Moji Guaçu, Reserva Biológica e Estação Experimental, 21 Jun 1988 (st), *Rossi et al.* 1195 (SP); Mun. Porto Ferreira, Reserva Florestal, 22 Nov 1975 (fl), *Silva et al. s.n.* (UEC 13842) (UEC); Mun. Águas de Lindóia, rd. to Barão de Ataliba, 9 May 1995 (fr), *Tamashiro et al.* 1039 (SP, UEC).

A species occurring in the states of Minas Gerais, Goiás, Distrito Federal, Mato Grosso, Bahia, Rio de Janeiro, Espírito Santo and São Paulo, usually found in the moist forests of the coastal states, and in the gallery forests of the cerrado biome of central Brazil. Many specimens have been traditionally annotated as *Ixora warmingii*, which is a later synonym of this species.

Because *Ixora brevifolia* Benth. was originally described by Bentham (1850), the type material was expected to be housed at K. After two distinct searches by the K herbarium staff, no type material (*Pohl s.n.* and *Widgren 1119*) pertaining to this species was found at this institution. Therefore, a search of duplicate specimens of *Widgren 1119* was initiated in the main herbaria where Widgren's collections were distributed (C, GOET, S, UPS; Vegter, 1988). Two duplicates of *Widgren 1119* were found at UPS, one of which is here selected as the lectotype of *Ixora brevifolia*.

Ixora gardneriana Benth., *Linnaea* 23:448. 1850. TYPE: BRAZIL. RIO DE JANEIRO: woods of Tijuca, Dec 1840, *Gardner* 5496 (HOLOTYPE: K!, photo at NY!; ISOTYPE: K!).

Ixora schottiana Muell. Arg., **syn. nov.**, *Flora* 58:455, 459. 1875. TYPE: BRAZIL. RIO DE JANEIRO: Serra Tingua, s.d. [1817–1820], *Schott* 889 (LECTOTYPE: G-DC n.v., here selected, photos at NY!; ISOTYPE: K!, photo at NY!).

Ixora riedeliana Muell. Arg., **syn. nov.**, *Flora* 58:455, 459. 1875. TYPE: BRAZIL [Southern Brazil]: without locality, s.d. [1821–1836], *Riedel s.n.* ["478"] (HOLOTYPE: G-DC n.v., photos at NY!; dubious ISOTYPE: NY!).

Ixora obscura Muell. Arg., **syn. nov.**, *Flora* 58:455, 459. 1875. TYPE: BRAZIL [Southern Brazil]: without locality, s.d. [1815–1817], *Sello s.n.* (HOLOTYPE: G-DC n.v., photos at NY!; ISOTYPE: B† [*Sello* 6018], photo at NY!).

Ixora truncata Muell. Arg., **syn. nov.**, in Mart., *Fl. Bras.* 6(5):459. 1881. TYPE: BRAZIL. RIO DE JANEIRO: Rio de Janeiro, s.d. [1861–1895], *Glaziou* 10933 (LECTOTYPE: G-DC n.v., here selected, photos at NY!; ISOLECTOTYPE: B†, photo at NY!).

Tree; bark smooth; branchlets glabrous. **Stipules** 2.5–3.5 × 1.5–2 mm, base deltoid, arista 1.5–2 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaf** blades elliptic or ovate, 5–13 × 2.5–5.5 cm,

apex acute, base acute, subcoriaceous, glabrous; secondary veins 6–14 each side, tertiary venation reticulate; petioles 5–12 mm long, glabrous. **Inflorescences** pedunculate, paniculate, pauci- or multi-florous, 5–11 × 3.5–6 cm; peduncles 0.5–2.5 cm long; **bracts** subtending the secondary branches often foliose, narrowly triangular to obovate, 5–10 mm long; **bracteoles** 1 or 2 per flower, triangular, 2–3 mm long, or absent. **Flower buds** ovoid at apex. **Pedicels** 2–7 mm long. **Flowers** pedicellate (rarely sessile), fragrant. **Calyx** 0.8–1 mm long; lobes deltoid, glabrous. **Corolla** 8–9 mm long, cream-white; tube 4.5–5.5 × 1–1.2 mm, glabrous outside, pubescent inside; lobes ovate, 3.5–4 × 2–2.5 mm, apex round, glabrous. **Stamens** 3.5–4 mm long; anthers narrowly oblong, 3.2–3.7 mm long, apex apiculate. **Style** 10.5–11 mm long; style branches narrowly oblong, 1.7–2 mm long. **Fruit** unknown.

Illustration.—Mart., Fl. Bras. 6(5), Tab. 9. 1881 (as *Ixora schottiana*).

Additional specimens examined. **BRAZIL. São Paulo:** São Paulo, Fda. Itatuba, 23 Dec 1931 (fl), *Amaral s.n.* (SP 28628) (NY, SP); São Paulo, Jardim Botânico, tree n. 179, 9 Dec 1931 (fl), *Hoehne s.n.* (SP 28588) (NY[2], SP); Mun. Campinas, Bosque de São José, 13 Sep 1994 (fl), *Santin & Bertani s.n.* (UEC 33566) (NY, UEC).

A very rare species, and certainly in danger of extinction, that occurs in the Atlantic forests of the states of Rio de Janeiro (Serra do Tinguá e Serra da Estrella) and São Paulo (Fda. Itatuba and Bosque de São José).

The holotype specimen has the stamp “Herbarium Benthonianum” and a label with the handwriting “5496, *Ixora Gardneriana* Benth, Linnaea 13:448” and the print “Brasilia, Gardner, 1841.” Whereas the isotype specimen has the stamp “Herbarium Hookerianum” and the handwritten label “5496, *Faramea* sp., a large shrub - woods of Tijuca, Dec./[18]40.” Because the label of the isotype was handwritten by Gardner, the locality and date reported on this specimen are considered more accurate.

Ixora heterodoxa Muell. Arg., Flora 58:454, 459. 1875. TYPE: BRAZIL. RIO DE JANEIRO: near Rio de Janeiro, s.d. [1861–1895], *Glaziou 6154* (HOLOTYPE: G-DC n.v., photos at NY!; ISOTYPE: B†, photo at NY).

Ixora burchelliana Muell. Arg., **syn. nov.**, Flora 58:454, 458. 1875. TYPE: BRAZIL. SÃO PAULO: “Prov. São Paulo,” s.d. [1825–1830], *Burchell 3208* (HOLOTYPE: fragments G-DC n.v., photos at NY!; ISOTYPE: BR!).

Ixora dimorphophylla Muell. Arg., **syn. nov.**, Flora 58:454, 458. 1875. TYPE: BRAZIL. Rio de Janeiro: Without locality, *Glaziou 705* (HOLOTYPE: C!, photo at NY!; ISOTYPES: BR!, K!; photo-K at NY!).

Ixora heterophylla Muell. Arg., **syn. nov.**, in Mart., Fl. Bras. 6(5):68. 1881. TYPE: BRAZIL. RIO DE JANEIRO: Serra Estrella, in fruticetis umbrosis, s.d. [1821–1836], *Riedel 342* (HOLOTYPE: G-DC n.v., photos at NY!; ISOTYPE: BR!).

Shrub 2–3(–5) m tall, rarely trees 5–8 m tall, 10–15 cm at dbh; bark smooth; branchlets glabrous. **Stipules** 5–6 × 2.5–3.5 mm, base deltoid, arista 2–3.5 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaf** blades ovate, elliptic to obovate, 5–18 × 2.5–7 cm, apex acute

or acuminate, base acute, membranaceous to chartaceous, glabrous; secondary veins 6–16 each side, tertiary venation reticulate; petioles 5–20 mm long, glabrous. **Inflorescences** pedunculate, paniculate, multiflorous, 6–9 × 4.5–9 cm, rachis usually filiform, red; peduncles 1.5–4 cm long, glabrous; leaves subtending the inflorescence smaller than those of lower nodes; **bracts** subtending the secondary branches narrowly triangular to lanceolate, 4–7 × 1–2 mm long; **bracteoles** 1 or 2 (rarely 3) each flower, triangular, 2–3 mm long, or rarely absent. **Flower buds** ovoid at apex. **Pedicels** absent or 2–4 mm long. **Flowers** sessile or short-pedicellate, fragrant. **Calyx** 0.7–1 mm long; lobes triangular, glabrous. **Corolla** 9–12 mm long, cream-white; tube 6–8.5 × 0.7–0.9 mm, glabrous outside, sparsely pubescent inside; lobes oblong, 2–3.5 × 1.7–2.5(–3.5) mm, apex round (rarely microscopically apiculate), glabrous. **Stamens** 1.6–1.9 mm long; anthers narrowly oblong, 1.5–1.8 mm long, apex apiculate. **Style** 8.5–13 mm long; style branches ovate, ca. 1 mm long. **Fruit** subglobose, didymous, 5–7 × 4–6 mm, glabrous, red to blackish.

Selected specimens examined: **BRAZIL. Paraná:** Mun. Guaraqueçaba, Rio Murato, 11 Dec 1970 (fl), G. Hatschbach 25807 (UB). **Rio de Janeiro:** Taquara da Tijuca, 1 Nov 1972 (fl), D. Sucre 9722 (NY, UB). **São Paulo:** Mun. Iguape, Estação Ecológica Juréia-Itatins, 7 Mar 1993 (fr), *Anunciação et al.* 190 (NY), 29 Oct 1994 (fl), *Anunciação & Rossi* 392 (NY); Mun. Ubatuba, Picinguaba, 11 Jan 1993 (fl), Assis 65 (NY); Mun. Ubatuba, 19 Apr 1995 (fr), *Assis & Carneiro* 529 (NY); Mun. Cananéia, Ilha do Cardoso, 10 Feb 1981 (fl), *Baitello* 46 (SPSF 7879), 25 Oct 1989 (fl), *Cordeiro et al.* 569 (IAC); between Ubatuba and Caraguatatuba, 10 m, 22 Aug 1976 (fl), *Davis et al.* 59883 (UEC); Mun. Ubatuba, 11 Mar 1989 (fr), *Furlan et al.* 677 (HRCB, SPSF), 12 Mar 1989 (fr), 780 (SPSF, NY), 788 (NY), 8 Dec 1989 (fl), 1014 (NY); Mun. Sete Barras, Fda. Intervalles, 12 Mar 1994 (fr), *Galetti et al.* 119 (SP); Mun. Cananéia, Ilha do Cardoso, 11 Feb 1981 (fl), *Jung-Mendaçolli* 479 (IAC), 31 Oct 1985 (fl), *Kirizawa* 1529 (IAC); São Paulo, Jardim Botânico, 4 Dec 1951 (fl), *Kuhlmann* 2806 (SP, UEC); Mun. Cubatão, Vale do Rio Pilões, 4 Oct 1988 (fl), *Leitão Filho & Pagano s.n.* (UEC 20804) (UEC); Mun. Cubatão, 23 Sep 1896 (fl), *Loefgren s.n.* (SP 11557) (SP); Mun. Peruíbe, Estação Ecológica de Juréia, 11 Nov 1982 (fl), *Rodrigues & Figueiredo s.n.* (UEC 15667) (UEC), 17 Nov 1982 (fl), *s.n.* (UEC 15679) (NY, UB, UEC); Mun. Peruíbe, Juréia, 6 Nov 1990 (fl), *Simão-Bianchini* 252 (NY); Mun. Peruíbe, Estação Ecológica Juréia-Itatins, Oct 1991 (fl), *Sobral & Attili* 7320 (HRCB); Mun. Peruíbe, Foz do Rio Guaraú, 9 Oct 1995 (fl), *Souza et al.* 9267 (NY).

A common species occurring in the states of Rio de Janeiro, São Paulo and Paraná, distinguishable by its leaf blades membranaceous to chartaceous, with tertiary (subsecondary) veins parallel to the secondary veins, inflorescences pauciflorous and with delicate-thin rachis (often filiform), and flower buds narrowly-tubular at base and ovoid at apex.

The names *Ixora heterodoxa*, *I. dimorphophylla* and *I. burchelliana* are synonymous and have equal priority because they were published in the same article by Müller Argoviensis (1875). The name *I. heterodoxa* is chosen over the others because its holotype is a complete specimen with flowers in bud and in anthesis, while the holotype of *I. burchelliana* (G-DC) is only represented by a leaf fragment. No type specimens of *I. dimorphophylla* are present at G-DC, and its holotype is at C, as it was indicated by Müller Argoviensis (1875).

Ixora syringiflora (Schltdl.) Muell. Arg., *Flora* 58:455. 1875. *Psychotria syringaeflora* Schltdl., *Linnaea* 28: 516. 1856. TYPE: BRAZIL [Bahia?]: locality unknown, s.d. [1828–1856], *Blanchet* 3348 (HOLOTYPE: B†, photo at NY!).

Ixora benthamiana Muell. Arg., **syn. nov.**, *Flora* 58:455, 459. 1875. TYPE: BRAZIL. RIO DE JANEIRO: Rio São João, s.d. [1817–1820], *Pohl* 2209 (LECTOTYPE, G-DC n.v., here selected, photo at NY!).

Tree to 10 m tall; branchlets glabrous. **Stipules** 4–6 × 2.5–3.5 mm, base deltoid, arista 3–4 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaf** blades elliptic, oblong-ovate, to narrowly obovate, 5.5–21 × 3–6.5 cm, apex acute, commonly deltoid-acuminate, base acute, membranaceous to chartaceous, glabrous; secondary veins 16–34 each side, tertiary venation reticulate; petioles 5–20 mm long, glabrous. **Inflorescences** pedunculate, paniculate, multiflorous, 10–14 × 10–14 cm, with 4–5 lateral branches laxely paniculate; peduncles 1.5–4 cm long, glabrous; leaves subtending the inflorescence smaller than those of lower nodes; **bracts** subtending the secondary branches narrowly triangular to narrowly elliptic, 6–15 × 1–4 mm long; **bracteoles** 1 or 2 each flower, ovate to oblong, 0.7–1 mm long, or rarely absent. **Flower buds** oblong-ellipsoid at apex. **Pedicels** absent or 2–5 mm long. **Flowers** sessile or short-pedicellate, fragrant. **Calyx** 0.7–1 mm long; lobes triangular or ovate, glabrous. **Corolla** 6.5–7.5 mm long, cream-white; tube 2–2.9 × 0.8–1 mm, glabrous outside, sparsely pubescent at distal portion inside; lobes oblong, 3.8–4.6 × 1.5–1.8 mm, apex round, glabrous. **Stamens** ca. 4.5 mm long; anthers narrowly oblong, ca. 3 mm long, apex apiculate. **Style** 6.5–8.5 mm long; style branches narrowly oblong, 1.5–2 mm long. **Fruit** unknown.

Illustration.—Mart., *Fl. Bras.* 6(5), Tab. 10. 1881 (as *Ixora benthamiana*).

Additional specimens examined. **BRAZIL. São Paulo:** Mun. São Paulo, Fda. Itatuba, 23 Dec 1931 (fl), *Amaral* s.n. (SP 28628) (K, MO, NY, SP); Mun. Porto Ferreira, Reserva Estadual de Porto Ferreira, 2 Dec 1981 (fl), *Bertoni* s.n. (UEC 16894) (NY, UEC); Mun. Campinas, Reserva Municipal de Santa Genebra, 7 Nov 1988 (fl), *Leitão Filho & Morellato* s.n. (UEC 22901) (UEC).

This species easily recognized by its laxely paniculate, many-branched, multiflorous inflorescences. It is a very rare, or probably extinct, species known only from four historical collections from the states of Rio de Janeiro and São Paulo (and probably Bahia, *Blanchet* 3348, the type specimen).

Ixora venulosa Benth., *Linnaea* 23:446. 1850. TYPE: BRAZIL. MINAS GERAIS: Caldas, s.d. [1841–1874], *Regnell* 1.275b (LECTOTYPE, K!, here selected, photo at NY!).

Shrub to 5 m tall or rarely **tree** to 9 m tall; bark rugose; branchlets glabrous. **Stipules** 4–8 × 3–4 mm, base narrowly triangular to oblong, arista 1–3 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaf** blades narrowly elliptic, oblong-elliptic, narrowly obovate to obovate, (1.5–)4–14 × 1–6 cm, apex acute, often acuminate, base acute or decurrent, chartaceous to subcoriaceous, glabrous; secondary veins fine and dense, 30–60 each side, tertiary venation subparallel to the secondary (sometimes somewhat

reticulate); petioles 2–15 mm long, glabrous. **Inflorescences** pedunculate, paniculate, pauciflorous, 2–8 × 1.5–6 cm, with 1 or 2 lateral branches, these sparsely branched; peduncles 1–6 cm long, glabrous; **bracts** subtending the secondary branches narrowly triangular, 7–10 × ca. 1 mm long, to narrowly elliptic, 10–13 × 3–5 mm; **bracteoles** 1 or 2 each flower, narrowly oblong-triangular, or absent. **Flower buds** ovoid at apex. **Pedicels** absent or to 2 mm long. **Flowers** sessile or short-pedicellate, fragrant. **Calyx** 0.3–1.2 mm long; lobes triangular or ovate, glabrous. **Corolla** 8.5–10.5 mm long, cream-white; tube 4.5–6.5 × 0.7–0.9 mm, glabrous outside, sparsely sericeous-pubescent inside; lobes oblong-ovate, 3.5–3.8 × 1.5–2.2 mm, apex round, glabrous, sometimes with undulate margin. **Stamens** 3.5–4 mm long; anthers narrowly oblong, 2.5–3 mm long, apex apiculate. **Style** 6.5–8.5 mm long; style branches oblong, 1.3–1.7 mm long. **Fruit** globose, 5–6.5 mm in diam., glabrous, red.

Selected specimens examined: **BRAZIL. Minas Gerais:** Monte Belo, Fda. Monte Alegre, 21 Feb 1982 (fr), *Vieira 300* (NY); Monte Belo, Fda. Lagoa, Mato Olaria, tree n. 498, 2 Nov 1987 (fl), *Vieira 1334* (NY). **Paraná:** Mun. Antonina, Reserva Biológica de Sapitanduva, 25°25'S, 48°43'W, 28 Nov 1984 (fl), *Cervi et al. s.n. (UPCB 22718)* (NY); Mun. Paranaguá, Serra da Prata, 50 m, 2 Nov 1962 (fl), *Hatschbach 9458* (HBR, NY); Mun. Morretes, Prainhas, 50 m, 29 Nov 1966 (fl), *Hatschbach 15290* (HBR, NY); Mun. São José da Boa Vista, Rio Jaguariaiva, Corredeira Paulista, 19 Nov 1970 (fl), *Hatschbach 25569* (NY); Mun. Guaraqueçaba, trail to Paraquara, 28 Oct 1971 (fl), *Hatschbach 27697* (US); Mun. Cascavel, Autodromo de Cascavel, 25 Oct 1975, *Hatschbach 37352* (US); Mun. Cerro Azul, Rio Turvo, 5 Oct 1977 (fl), *Hatschbach 40215* (NY); Mun. Marumbi, Serra do Mar, Nov 1971, *Kuniyoshi 3121* (US); Mun. Cerro Azul, Mato Preto, Rio Ribeira, 10 Feb 2001 (fr), *Ribas & Silva 3214* (US); Mun. São José dos Pinhais, Castelhanos, Rio Arraial, 30 Oct 1996 (fl), *Silva & Saldanha 1742* (NY, US); Mun. Guaratuba, Rio Arraial, Fda. Bamerindus, 1 Nov 1996 (fl), *Silva & Saldanha 1772* (US). **Rio de Janeiro:** Rio de Janeiro, s.d., *Glaziou s.n.* (NY). **Santa Catarina:** Mun. Garuva, Três Barras, 21 Jan 1958 (fr), *Reitz & Klein 6223* (FLOR, HBR, NY, US); Mun. Joinville, s.d., *Schenk 1209* (K. Schum. in Mart., Fl. Bras. 6(6):399. 1889). **São Paulo:** Mun. Teodoro Sampaio, Parque Estadual do Morro do Diabo, 22 Jun 1994 (fr), *Baitello 681* (SP, SPSF); Mun. Corumbatai, rd. Washington Luiz, 22°15'S, 47°42'W, 27 Oct 1993 (fl), *Barreto et al. 1512* (ESA); Mun. Cabreúva, 23°16'S, 47°02'W, 16 Mar 1994 (fr), *Barreto et al. 2175* (ESA, NY); Mun. Campinas, Fda. São Vicente, 11 Oct 1989 (fl), *Bernacci s.n. (ESA 13210, UEC 25044)* (ESA, UEC), 29 Aug 1990 (fr), *117* (NY); Mun. Tietê, Instituto Agrônômico, 20 Jul 1994 (fr), *Bernacci et al. 528* (NY, UEC); Dto. Souza, Condomínio Colinas do Atibaia, 12 Sep 1995 (fl), *Cardamone et al. 186* (ESA, NY, UEC); Mun. Ipeúna, 11 Oct 1985 (fl), *Catharini & Mantovani 471* (ESA, NY); Mun. Anhembi, Fda. Barreiro Rico, 9 Oct 1979 (fl), *César s.n. (HRCB 2404)* (HRCB), 16 Oct 1981 (fl), *s.n.* (NY), 15 Dec 1981 (fr), *s.n. (HRCB 3049)* (HRCB, NY); Mun. Itirapina, 21 Dec 1983 (fl), *César s.n. (HRCB 3770)* (HRCB, NY); Mun. Assis, Estação Ecológica, 9 Apr 1992 (fr), *Durigan s.n. (SPSF 15117)* (SPSF); Mun. Eldorado, Caverna do Diabo, 24°38'S, 48°23'S, 9 Feb 1995 (fr), *Fernandes et al. 32695* (ESA, NY, UEC); Mun. Botucatu, Fda. São João, 19 Oct 1988 (fl), *Gabriel s.n. (HRCB 10569)* (HRCB); Mun. Guarulhos, Aeroporto Internacional, 22 Nov 1984 (fl), *Gandolfi et al. s.n. (ESA 5605)* (ESA, NY); Mun. São Pedro, Cachoeira da Peroba, 22°32'S, 47°56'W, 22 Feb 1991 (fr), *Gandolfi et al. s.n. (ESA 32657)* (ESA, NY); Mun. São Paulo, Butantan, 1 Dec 1921 (fl), *Gehrt s.n. (SP 7538)* (NY, SP); Mun. Valinhos, área de reforma agrária, 16 Aug 1994 (fr), *Jung-Mendaçolli et al. 609* (NY); Mun. Jundiaí, Estação Experimental do IAC, 28 Sep 1994 (fl), *Jung-Mendaçolli et al. 624* (IAC, NY, UEC), 5 Apr 1995 (fr), *1412* (NY, UEC); Mun. Ipanema, 20 Oct 1887 (fl), *Loefgren s.n.* (NY, SP); Mun. São Paulo, Instituto de Biociência, Cidade Universitária, 740 m, 19 Aug 1972 (fr), *Klein 10210* (HBR, NY, US), 23 Nov 1973, *10980* (HBR, NY, US); Mun. Amparo, Monte Alegre, Fda. Sta. Isabel, 07 May 1942 (fl), *Kuhlmann & Lemos 1179* (NY, SP); Mun. Itararé, Ibiti, 900 m, 26 Jul 1946, *Kuhlmann &*

Kuhn 1386 (IAC, NY), 29 Jul 1946 (st), *Kuhlmann 1393* (SP); Mun. São João da Boa Vista, 12 Nov 1947 (fl), *Kuhlmann 1484* (IAC, NY); Mun. Jundiá, Serra do Japi, 7 Nov 1981 (fl), *Leitão Filho et al. s.n. (UEC 13102)* (NY, UEC), *s.n. (UEC 13146)* (UEC); Mun. Santa Rita do Passo Quatro, Parque Estadual de Vassununga, 26 Oct 1978 (fl), *Martins s.n. (UEC 9999)* (UEC), *s.n. (UEC 10000)* (UEC); Mun. Paulínia, Fda. São Francisco, 20 Apr 1980 (fr), *Martins et al. s.n. (UEC 11170)* (UEC); Mun. Águas da Prata, Reserva Estadual, 47°20'W, 21°52'S, 1120 m, 21 Mar 1994 (fr), *Martins et al. 31413* (NY, SP); Mun. Atibaia, Fda. Grotta Funda, 16 Nov 1987 (fl), *Meira Neto et al. s.n. (UEC 21316)* (UEC); Mun. Avaí, Rio Batalha, 9 Apr 1997 (fr), *Miranda & Miranda 322* (SP), 16 Oct 1997 (fl), 376 (NY); Mun. Guareí, Sarandi, 23°20'S, 48°14'W, 9 Nov 1980 (fl), *Neves & Cerantola IPH-USP 37* (UEC); Mun. Cajuru, Fda. Santana, 3 Oct 1999 (fl), *Nicolau et al. 1792* (SP); Mun. Jaú, Fda. Santo Antonio, 14 Oct 1988 (fl), *Nicolini s.n. (HRCB 11930)* (HRCB); Mun. Américo Brasiliense, Fda. Serrinha, 25 May 1944 (fr), *Pickel s.n. (SPSF 1108)* (SPSF); Mun. Campinas, Bairro Helvétia, sítio São Francisco, 4 Nov 1946 (fl), *Pickel s.n. (SPSF 2836)* (SPSF); Mun. Ipeúna, Remanescente Florestal do Rio Passa Cinco, 10 May 1989 (fr), *Rodrigues & Zandoval s.n. (ESA 6510)* (ESA, NY); Mun. Itu, 25 Dec 1897 (fl), *Russel 198* (SP); Mun. Campinas, Reserva Municipal de Santa Genebra, 3 Jul 1991 (st), *Zickel s.n. (UEC 30350)* (UEC); Moji Guaçu, Reserva Biológica, 2 Jun 1992 (fl), *Zifirino & Romaniuc Neto 16* (NY, SP).

PARAGUAY: Alto Paraná: Reserva Biológica, near Río Itabó, embalse Itaipú of Río Paraná, 25°05'S, 54°05'W, 16 Oct 1996 (fl), *Schinini et al. 31471* (NY).

A species readily distinguishable for the leaf blades with fine, dense venation (30–60 secondary veins each side), common in the moist Atlantic forests of the Brazilian states of Rio de Janeiro, São Paulo, Paraná, and Santa Catarina, and in the gallery forests of the cerrado biome of Minas Gerais, and occasionally found in Paraguay.

KEY TO THE NATIVE SPECIES OF *IXORA* OF THE STATE OF SÃO PAULO, BRAZIL

1. Leaf blade with dense, equal secondary venation (30–60 each side); tertiary veins dense and parallel to the secondary veins _____ ***I. venulosa***
1. Leaf blade with sparse, unequal secondary venation (6–40 each side); tertiary veins subreticulate.
 2. Corolla lobes shorter than the tube; flower buds ovoid at apex.
 3. Corolla tube 6–8.5 mm long, lobes 2–3.5 mm long; stipules 5–6 × 2.5–3.5 mm, with an arista 2–3.5 mm long _____ ***I. heterodoxa***
 3. Corolla tube 4.5–5.5 mm long, lobes 3.5–4 mm long; stipules 2.5–3.5 × 1.5–2 mm, with an arista 1.5 mm long _____ ***I. gardneriana***
 2. Corolla lobes longer than the tube; flower buds oblong-ellipsoid at apex.
 4. Inflorescence 10–14 cm in diam., with 4–5 secondary branches, these densely branched and laxely paniculate _____ ***I. syringiflora***
 4. Inflorescence 3–8(–10) cm in diam., with 2–3 secondary branches, these sparsely branched and corymbiform _____ ***I. brevifolia***

ACKNOWLEDGMENTS

I am extremely grateful to Sigrid Jung-Mendaçolli (IAC), coordinator of the Rubiaceae treatment for the *Flora Fanerogamica do Estado de São Paulo*, for inviting me to contribute *Ixora* for the flora, for her productive collaboration, and for arranging the loans of *Ixora* from the herbaria of the state of São Paulo to the NY herbarium. I am also much indebted to the Conselho Nacional de Pesquisa e Desenvolvimento Científico e Tecnológico (CNPq), Brazilian Govern-

ment, for granting permission to perform field and herbarium work in the states of Goiás and Santa Catarina, during 1998–2000. I also wish to thank the directors and curators of the following herbaria for sending material on loan and for facilitating the access to their collections: BR, C, ESA, FLOR, HBR, HRCB, IAC, K, MO, NY, S, SP, SPSF, UB, UFG, UEC, UPCB, UPS and US. My sincere gratitude goes to the staff of the G-DC herbarium for producing and sending the 80 black and white negatives of *Ixora* types, and to The New York Botanical Garden for printing the photos used in this study. I also wish to thank the staff of the Kew herbarium (K), Jochen Heinrichs (GOET), and Arne Anderberg (S) for searching for the type specimens of *Ixora brevifolia* in their institutions. I am particularly grateful to Roland Moberg, Curator of the UPS herbarium, for sending the type specimen of *Ixora brevifolia* on loan to NY, and for additional information. Special thanks are also due to Claes Persson (GB) and Petra de Block (BR) for the constructive comments on the manuscript.

REFERENCES

- BENTHAM, G. 1850. *Ixora*. In: *Plantae Regnellianae*. *Linnaea* 23:446–448.
- DE BLOCK, P. 1998. The African species of *Ixora* (Rubiaceae–Pavetteae). *Opera Bot. Belg.* 9: 1–218.
- DELPRETE, P.G. (In press) *Ixora*. In: M.G.L. WANDERLEY, G.J. SHEPHERD & A.M. GIULIETTI (Coordinators), *Flora Fanerogâmica do Estado de São Paulo*. Editora Hucitec, São Paulo.
- DELPRETE, P.G., L.B. SMITH, and R.J. DOWNS. (submitted) Rubiaceae. In: A. REIS (Editor), *Flora Ilustrada Catarinense*. Herbário Barbosa Rodrigues, Itajaí, Santa Catarina.
- MÜLLER ARGOVENSIS, J. 1875. Rubiaceae brasilienses novae. *Flora* 58:449–459.
- MÜLLER ARGOVENSIS, J. 1881. *Ixora* (Rubiaceae. Tribes I–VI). In: C.F.P. MARTIUS, A.G. EICHLER, and I. URBAN, *Flora Brasiliensis*, Vol. 6(5):57–75. F. Fleisher, Lipsia.
- VEGTER, I.H. 1988. Index Herbariorum, Part II (7), Collectors Tt/mZ. *Regnum Veg.* 117: 987–1213.